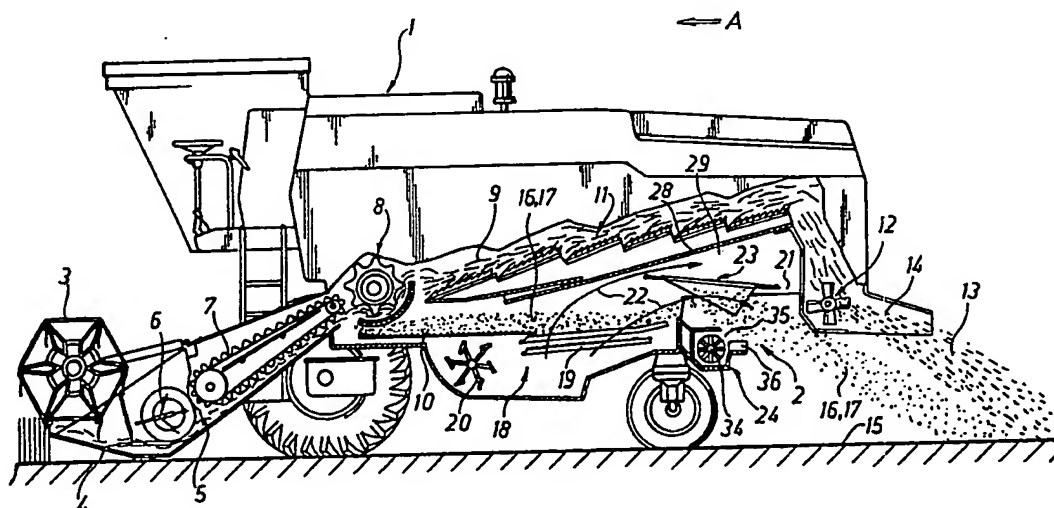




## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification <sup>5</sup> :  A01D 41/12	A1	(11) International Publication Number: WO 92/05687 (43) International Publication Date: 16 April 1992 (16.04.92)
(21) International Application Number: PCT/SE91/00659 (22) International Filing Date: 2 October 1991 (02.10.91) (30) Priority data: 9003121-2 2 October 1990 (02.10.90) SE (71) Applicant (for all designated States except US): REKORD- VERKEN SWEDEN AB [SE/SE]; Öttum, S-535 00 Kvänum (SE). (72) Inventor; and (75) Inventor/Applicant (for US only): NILSSON, Peter [SE/ SE]; de la Gardievägen 13, S-351 50 Lidköping (SE). (74) Agent: AWAPATENT AB; Box 53252, S-400 16 Göteborg (SE).		(81) Designated States: AT (European patent), AU, BE (Euro- pean patent), BR, CA, CH (European patent), DE (Eu- ropean patent), DK (European patent), ES (European patent), FR (European patent), GB (European patent), GR (European patent), IT (European patent), JP, LU (European patent), NL (European patent), SE (Euro- pean patent), SU <sup>+</sup> , US.  Published With international search report. In English translation (filed in Swedish).

(54) Title: A DEVICE FOR SPREADING CHAFF AND HUSKS FROM A COMBINE HARVESTER



## (57) Abstract

A device for spreading chaff (16) and husks (17) from a combine harvester across substantially the entire harvester cutting width. The chaff and the husks are carried in an exiting stream of air which is directed essentially rearwardly as seen in the direction of travel (A) of the harvester, from a screening means (18) designed to separate the chaff (16) from the corn (10), to a downwardly directed outlet (21) from said screening means. In the area of the screening means outlet (21) there is a deflector (23) to deflect the exiting stream of air (22) in which the chaff (16) and the husks (17) are carried, in a direction laterally and downwardly as seen in the direction of travel (A), towards the ground, in order to distribute and spread the chaff and husks across the entire cutting width.

# + DESIGNATIONS OF "SU"

Any designation of "SU" has effect in the Russian Federation. It is not yet known whether any such designation has effect in other States of the former Soviet Union.

## *FOR THE PURPOSES OF INFORMATION ONLY*

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AT	Austria	ES	Spain	MG	Madagascar
AU	Australia	FI	Finland	ML	Mali
BB	Barbados	FR	France	MN	Mongolia
BE	Belgium	GA	Gabon	MR	Mauritania
BF	Burkina Faso	GB	United Kingdom	MW	Malawi
BG	Bulgaria	GN	Guinea	NL	Netherlands
BJ	Benin	GR	Greece	NO	Norway
BR	Brazil	HU	Hungary	PL	Poland
CA	Canada	IT	Italy	RO	Romania
CF	Central African Republic	JP	Japan	SD	Sudan
CG	Congo	KP	Democratic People's Republic of Korea	SE	Sweden
CH	Switzerland	KR	Republic of Korea	SN	Senegal
CI	Côte d'Ivoire	LI	Liechtenstein	SU <sup>+</sup>	Soviet Union
CM	Cameroon	LK	Sri Lanka	TD	Chad
CS	Czechoslovakia	LU	Luxembourg	TC	Togo
DE	Germany	MC	Monaco	US	United States of America
DK	Denmark				

A device for spreading chaff and husks from a combine harvester.

The subject invention concerns a device for spreading chaff and husks from a combine harvester across substantially the entire cutting width of the harvester, said harvester comprising a screening means to separate the chaff from the grain, as well as a device generating a discharge stream of air which is essentially rearwardly directed as seen in the direction of travel of the harvester, said stream of air serving to direct the chaff and the husks away from the screening means to an essentially downwardly directed outlet from said means.

Conventional combine harvesters are fitted with a pick-up reel including a cutting table the width of which greatly exceeds that of the harvester proper. In harvesting straw feed crops, the consequence hereof will be deposition, after threshing, of the chaff and husks on the ground, i.e. the field, in a comparatively narrow string the width of which essentially agrees with that of the screening means. Today, it is common practice to chop up or cut the straw after threshing by means of a chopper and to spread the chopped material over an area having a width essentially corresponding to that of the cutting table and to later plough in the chopped material into the soil. Consequently, the field will exhibit string-shaped areas wherein the contents of chaff and husks exceed those of adjoining areas the chaff and husk contents of which are practically nul. Such uneven distribution changes the conditions of growth and as a rule, growth is hampered by too large quantities of undecayed straw, chaff and husks.

The purpose of the subject invention is to provide a device designed to spread the chaff and husks over substantially the entire cutting width of the harvester, thus ensuring a continuous and even distribution across the field. The arrangement must not affect the feed of unchopped straw to the chopper, nor negatively affect the

separation of the chaff from the grain. In addition, also when the straw is to be deposited in the form of strands, for example, it must still be possible to spread the chaff and husks over the entire cutting width of the harvester  
5 without, however, causing spreading of the straw or interference with the straw feed.

These and other purposes in accordance with the invention are achieved by the provision of a deflector in the area of the screening means outlet to deflect the  
10 exiting stream of air in which the chaff and the husks are carried, towards the ground in a lateral and downwards direction with respect to the direction of advancement of the harvester, as well as to distribute and spread the chaff and husks on the ground across the cutting width,  
15 said deflector being in the shape of a body formed with deflecting surfaces, said surfaces extending obliquely with respect to the essentially rearwardly directed, exiting stream of air for the purpose of deflecting said stream of air laterally and downwardly, said body having  
20 a size which is so much smaller than the downwardly directed outlet of the screening means and which is so positioned with respect to the latter that the pressure drop of the exiting stream of air across the body is minimal, a gap being defined between the upper delimitation face of the body and an upper partition wall  
25 positioned opposite the downwardly directed outlet of the screening means, said gap allowing passage there-through of part of the exiting stream of air.

The invention will be described in closer detail in  
30 the following with reference to the accompanying drawings, wherein

Fig. 1 is a schematical and partly broken lateral view of the combine harvester fitted with the device in accordance with the invention,

35 Fig. 2 is a perspective view as seen obliquely from behind and below, of the part of the combine harvester in accordance with Fig. 1 where the device in accordance

with the invention is positioned,

Figs. 3a-c are perspective views as seen obliquely from behind of some embodiments of a deflector incorporated in the device in accordance with the invention,

5 Figs. 4A, 5A and 6A illustrate the rear part of the harvester in accordance with Fig. 1 in schematic and partly broken views, to illustrate alternative positions of the deflector, and

10 Figs. 4B, 5B and 6B show views as seen in the direction of respectively arrows B, C and D in Figs. 4A, 5A and 6A.

The combine harvester designated generally by reference 1 in the drawing figures is of rather conventional configuration with the exception of the device in accordance with the invention, generally designated by  
15 reference 2. It has a pick-up reel 3 including a cutting table 4 having a width considerably exceeding that of the harvester 1 proper, for instance double that width. The cut straw-feed crop 5 is transported via a transverse  
20 conveyor 6 and a longitudinal conveyor 7 up to a thresher 8, where the straw 9 is separated from the grain 10. The straw 9 is furthered via an oscillating conveyor 11 up to an impact chopper 12 positioned at the rear end of the harvester as seen in the direction of travel of the  
25 latter. The chopper 12 chops up or cuts the straw 9 into smaller pieces and a spreader, not illustrated in detail and positioned adjacent an outlet 14, spreads the chopped straw pieces 13 onto the ground, i.e. the field 15, over an area the width of which essentially corresponds to the  
30 width of the cutting table 4.

The grain 10 from the thresher as well as the chaff 16 and husks 17 are feed to a screening device 18 comprising a number of screens 19 and a screening fan 20. The chaff 16 and the husks 17 are separated from the  
35 heavier grain 10 when passing through the screens 19, the chaff and the husks being blown away in the direction towards an essentially downwardly directed outlet

21 from the screening device 18, with the aid of the generally rearwardly directed stream of air 22 which is generated by the screening fan 20.

5 A deflector, generally designated by reference 23, is positioned in the area of the outlet 21 of the screening device 18. The purpose of the deflector is to deflect the exiting stream of air 22 carrying the chaff 16 and the husks 17 laterally and downwardly as seen in the direction of travel A, towards the ground 15, and to  
10 distribute and spread the chaff and the husks onto the ground across the entire cutting width of the harvester 1, as illustrated in Figs. 1 and 2.

Downstream of the deflector 23 as seen in the direction of flow of the exiting stream of air 22, there is  
15 provided a unit, designated generally by reference 24, which is designed to impart a further laterally extended distributing movement to the stream of air for more efficient spreading of the chaff 16 and the husks 17 over the cutting width.

20 Generally speaking, the deflector 23 is shaped as a body 25 comprising deflecting surfaces 26 which are oblique with respect to the rearwardly directed exiting stream of air 22 so as to deflect said stream of air laterally and downwardly.

25 Owing to this arrangement, the spatial extent of the body 25 becomes much smaller than that of the downwardly directed outlet 21 of the screening device 18 and the body 25 will assume such a relative position with respect to said outlet that the pressure drop of the  
30 exiting stream of air 22 across the body 25 becomes minimal, in addition to which a gap 29 will be defined intermediate the upper delimitation face 27 of the body and an upper partition wall 28 positioned opposite the downwardly directed outlet 21 of the screening device 18,  
35 which gap 29 allows passage therethrough of part of the exiting stream of air.

In accordance with the embodiments illustrated in the drawings, the body 25 is in the form of a bent plate of a suitable, preferably rigid material, such as sheet metal. When required, the sheet metal element may be  
5 coated on  
at least its oblique surfaces 26 with a vibration-dampening and/or sound absorbing substance. Obviously, it is quite possible to manufacture the entire plate 25 from a vibration-dampening and/or sound absorbing  
10 material.

In accordance with the embodiment illustrated in Figs. 1, 2 and 3, the plate 25 has a generally V-shaped profile whereas in accordance with the embodiment of Fig. 3b, the profile configuration is a combination of a  
15 V-shape and a U-shape and the embodiment in accordance with Fig. 3c has a U-shaped profile configuration with the legs of the U-shape tapering outwards. Other profile configurations are, of course, possible, the condition being that the stream of air 22, carrying the chaff 16  
20 and the husks 17, is deflected laterally and downwards.

In all embodiments according to Figs. 1-3 the plate 25 has a cross-section which increases, preferably progressively, in the direction of travel A from its front point 30 towards the rear edge 31.

25 As appears from Figs. 1 and 2, the plate 25 is freely suspended in the chassis of the combine harvester 1 along the upper plate edges 32, preferably in stays 33 or similar means attached to the harvester chassis.

The unit 24 described above, designed to impart the  
30 further laterally extended distributing motion to the exiting stream of air 22 downstream of the deflector 23 in the form of a plate 25, comprises a fan 34 which is mounted on the harvester at a level below the plate 25, cf. Figs. 1 and 2. In accordance with the embodiment  
35 illustrated, the fan 34 is a cross-flow fan having an essentially horizontal outlet 35, the width of which essentially agrees with that of the outlet 21 of the

screening device 18. The outlet 35 houses spreader means 36 in the form of configured guide plates serving to direct the outlet air 37 from the fan 34 towards the exiting stream of air carrying the chaff 16 and the husks 17. Owing to this arrangement, the exiting stream of air is given the further laterally extended distributing motion, ensuring that the chaff and the husks are spread onto the ground 15 across entire the cutting breadth ahead of the chopped straw 13, as seen in the direction of travel A.

Alternatively, the unit 24 above could include, instead of the cross-flow fan 34, one or several rotor-type spreaders which, like the first-mentioned spreaders, are positioned in the area below the plate 25 and which may be arranged to rotate about rotational shafts which are substantially vertical or extend obliquely with respect to the vertical. When the rotational spreader or spreaders is (are) hit by the stream of air 22 carrying the chaff 16 and the husks 17, said stream of air is given the above distributing motion having a further lateral extent.

Figs. 4-6 illustrate some other possible alternative positions of the deflector 23 described in the foregoing.

In accordance with Figs. 4A and 4B the deflector 23 assumes an essential vertical position in the area of the outlet 21 and it is preferably mounted on a guide plate 38 which is incorporated in the chopper 12. The deflector 23 extends downwards from the outlet 21 and terminates essentially opposite the unit 24.

In accordance with the alternative illustrated in Figs 5A and 5B, the deflector 23 is positioned obliquely downwardly and rearwardly in said area and preferably it is mounted on a crosswise stay 39 arranged on the hood of the harvester 1. Also in this case the deflector 23 extends downwards from the outlet to the level flush with the unit 24.



7

Finally, in accordance with the alternative shown in Figs. 6A and 6B, the deflector 23 is mounted on the lower face of the chopper 12 in the area of the outlet 21 and level with or opposite the unit 24.

5       The invention should not be regarded as restricted to the embodiments illustrated and described herein but a number of modifications are possible within the scope of the appended claims.

10

15

20

25

30

35

CLAIMS

1. A device for spreading chaff (16) and husks (17) from a combine harvester (1) across substantially the entire cutting width of the harvester, said harvester (1) comprising a screening means (18) to separate the chaff (16) from the grain (10), as well as a device (20) generating a discharge stream of air (22) which is essentially rearwardly direction as seen in the direction of travel (A) of the harvester (1), said stream of air (22) serving to direct the chaff (16) and the husks (17) away from the screening means (18) to an essentially downwardly directed outlet (21) from said means, characterized by a deflector (23) which is positioned in the area of the outlet (21) of the screening means (18) to deflect the exiting stream of air (22) in which the chaff (16) and the husks (17) are carried, towards the ground (15) in a lateral and downwards direction with respect to the direction of advancement (A) of the harvester, as well as to distribute and spread the chaff and the husks on the ground across the cutting width, said deflector (23) being the shape of a body (25) formed with deflecting surfaces (26), said surfaces extending obliquely with respect to the essentially rearwardly directed, exiting stream of air (22) for the purpose of deflecting said stream of air laterally and downwardly, said body (25) having size which is so much smaller than the downwardly directed outlet (21) of the screening means (18) and which is so positioned with respect to the latter that the pressure drop of the exiting stream of air (22) across the body (25) is minimal, a gap (29) being defined between the upper delimitation face (27) of the body and an upper partition wall (28) positioned opposite the downwardly directed outlet (21) of the screening means (18), said gap allowing passage therethrough of part of the exiting stream of air.

2. A device as claimed in claim 1, c h a r a c -  
t e r i z e d in that the body is in the form of a bent  
plate (25) of an essentially V-shaped or U-shaped profile  
configuration with the legs of the U being straight or  
5 inclined, and in that the plate cross-section increases  
as seen in the direction of travel (A), from the front  
point (30) of the plate towards the rear edge (31)  
thereof.

3. A device as claimed in claim 2, c h a r a c -  
10 t e r i z e d in that the plate (25) is freely suspended  
in the chassis of the harvester (1) along its upper edges  
(32).

15

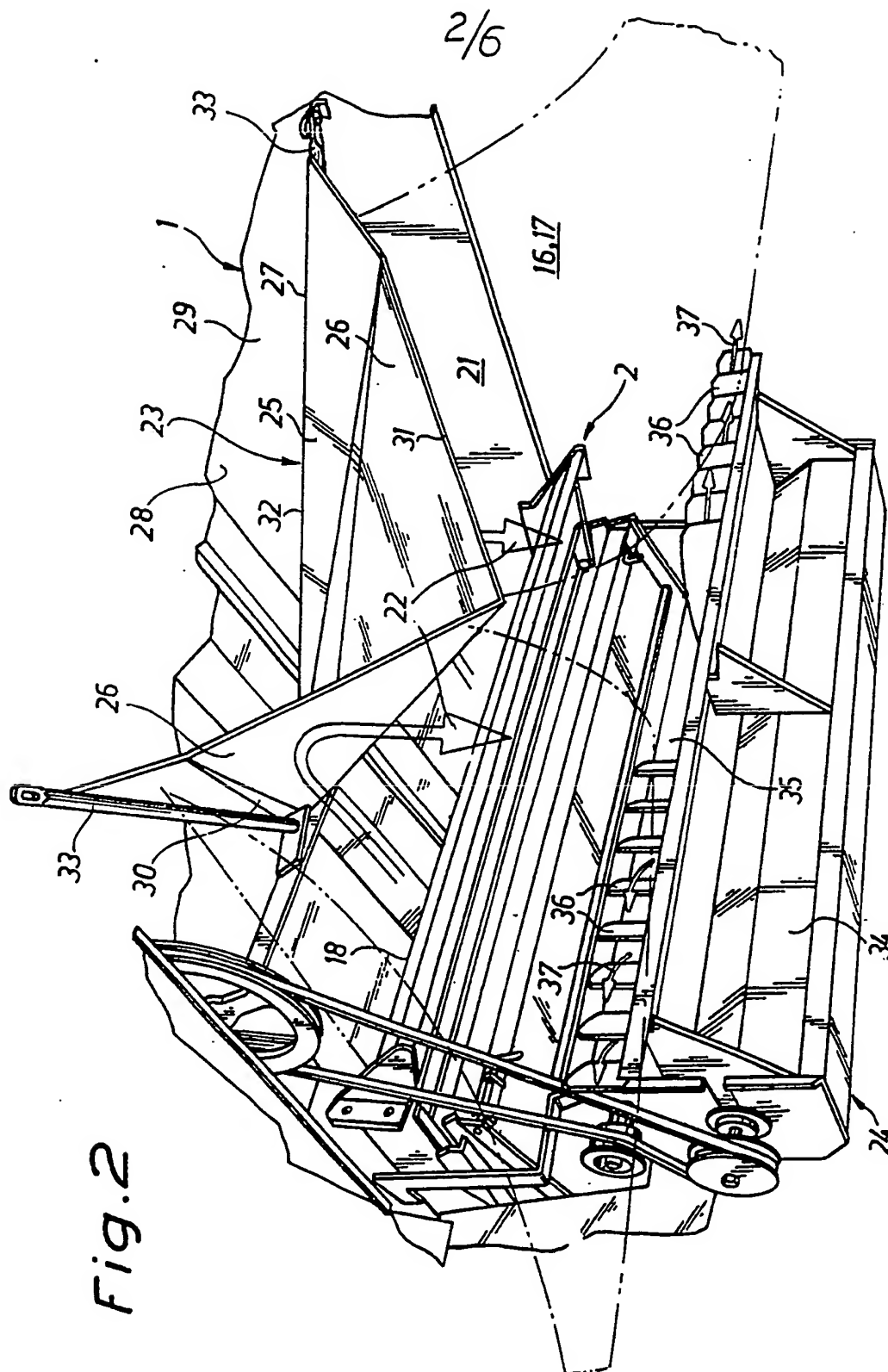
20

25

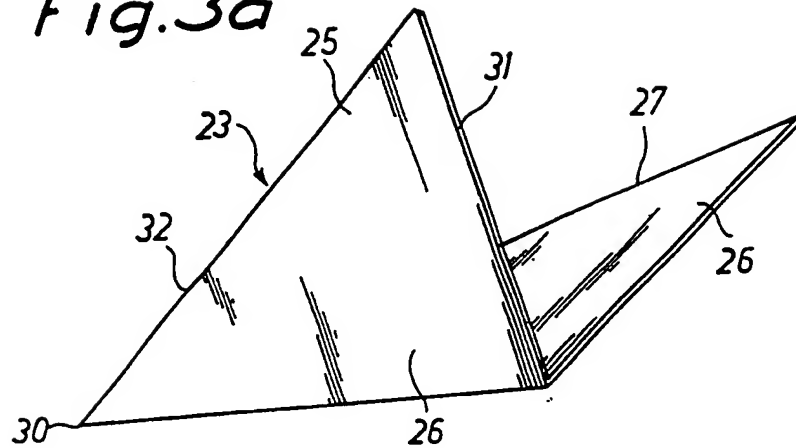
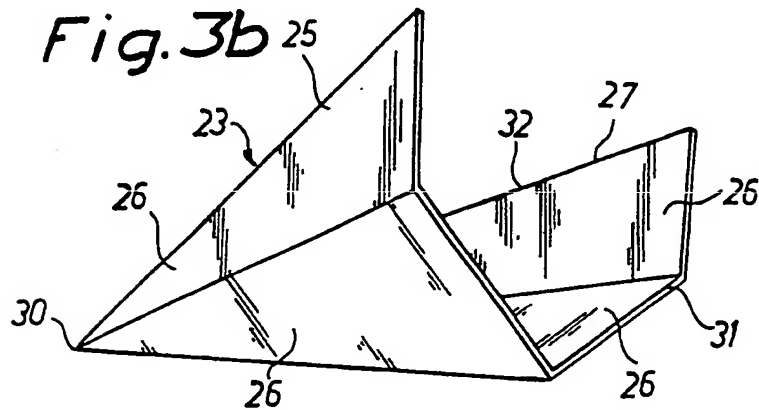
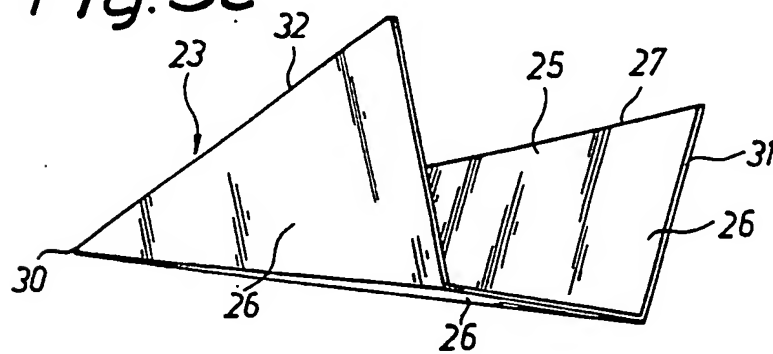
30

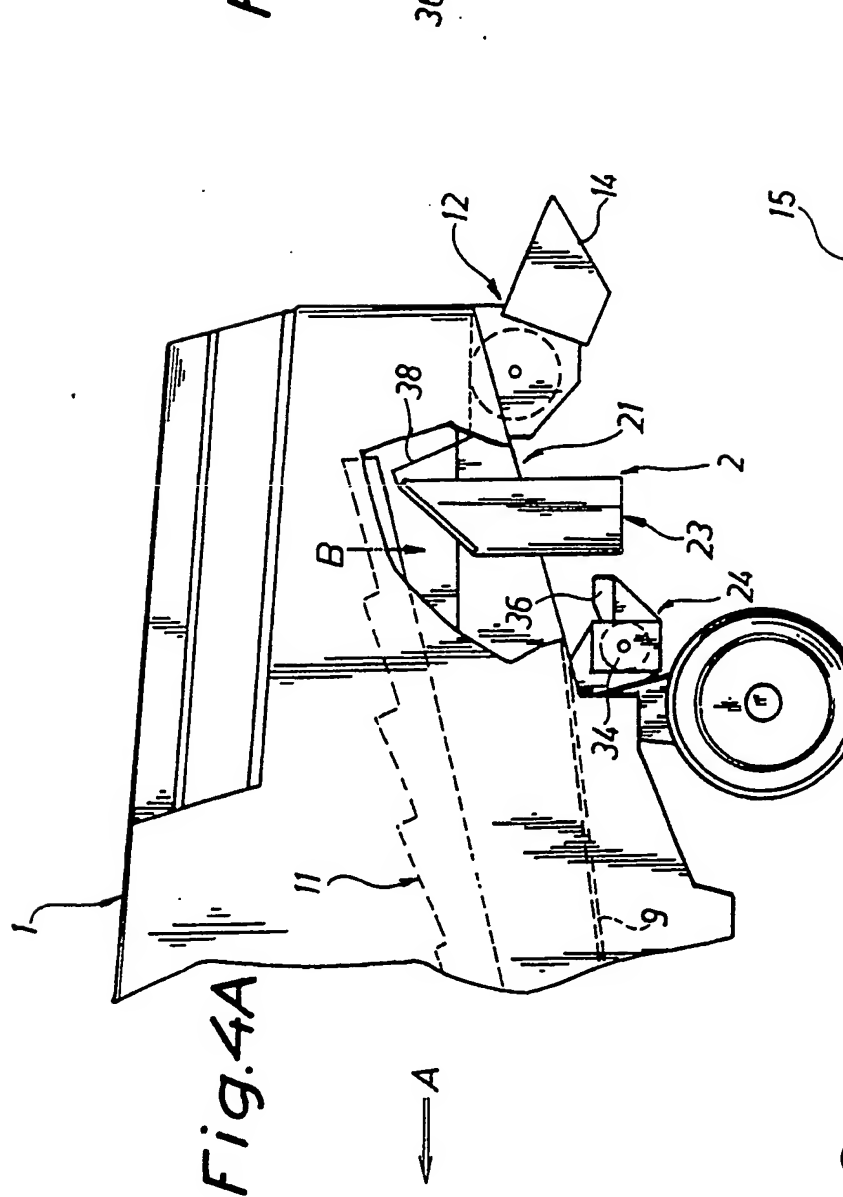
35





3/6

*Fig. 3a**Fig. 3b**Fig. 3c*



4/6

$$\frac{5}{6}$$

Fig. 5B

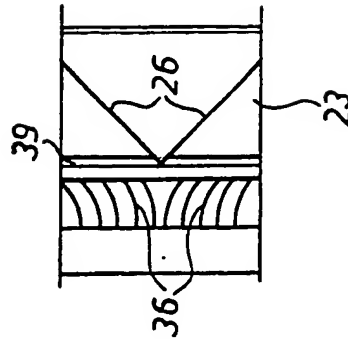
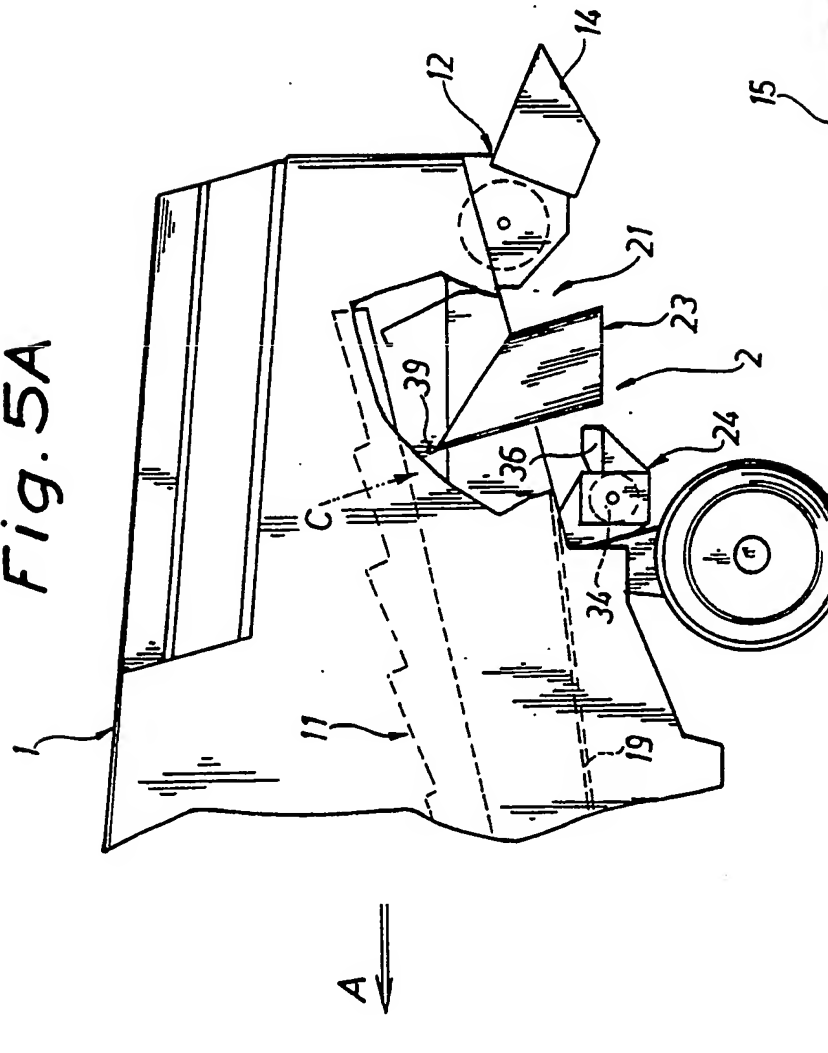


Fig. 5A





6/6

Fig.6B

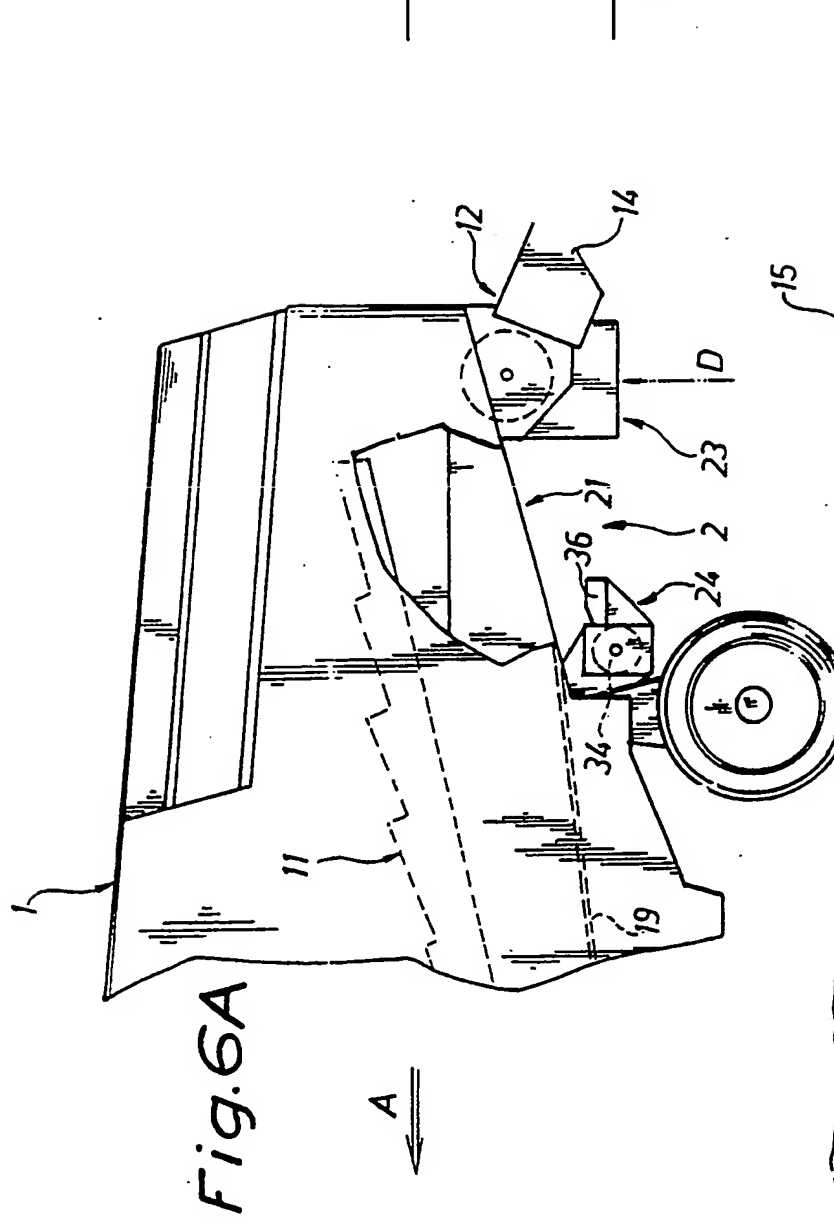
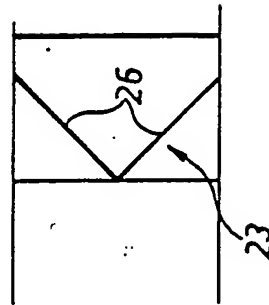
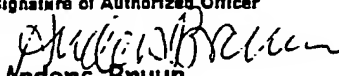


Fig.6A

# INTERNATIONAL SEARCH REPORT

International Application No PCT/SE 91/00659

<b>I. CLASSIFICATION OF SUBJECT MATTER</b> (if several classification symbols apply, indicate all) <sup>6</sup>		
According to International Patent Classification (IPC) or to both National Classification and IPC		
IPC5: A 01 D 41/12		
<b>II. FIELDS SEARCHED</b>		
Minimum Documentation Searched <sup>7</sup>		
Classification System	Classification Symbols	
IPC5	A 01 D; A 01 F	
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in Fields Searched <sup>8</sup>		
SE,DK,FI,NO classes as above		
<b>III. DOCUMENTS CONSIDERED TO BE RELEVANT<sup>9</sup></b>		
Category *	Citation of Document, <sup>11</sup> with indication, where appropriate, of the relevant passages <sup>12</sup>	Relevant to Claim No. <sup>13</sup>
A	US, A, 4711253 (ANDERSON) 8 December 1987, see column 3, line 14 - line 18; figure 3 ---	1-3
A	DE, A1, 3824166 (DEERE & CO EUROPEAN OFFICE) 18 January 1990, see column 3, line 35 - column 4, line 48; figures 1-3 --	1
A	DE, C1, 3542577 (BISO BITTER GMBH & CO KG) 26 February 1987, see the whole document -- -----	1
<p>* Special categories of cited documents:<sup>10</sup></p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance, the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"Y" document of particular relevance, the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.</p> <p>"&amp;" document member of the same patent family</p>		
<b>IV. CERTIFICATION</b>		
Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report	
18th December 1991	1992 -01- 13	
International Searching Authority	Signature of Authorized Officer	
SWEDISH PATENT OFFICE	 Anders Bruun	

Form PCT/ISA/210 (second sheet) (January 1985)

**ANNEX TO THE INTERNATIONAL SEARCH REPORT  
ON INTERNATIONAL PATENT APPLICATION NO.PCT/SE 91/00659**

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report. The members are as contained in the Swedish Patent Office EDP file on 31/10/91. The Swedish Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US-A- 4711253	87-12-08	NONE	
DE-A1- 3824166	90-01-18	NONE	
DE-C1- 3542577	87-02-26	EP-A-B- 0224750 EP-A- 0371964	87-06-10 90-06-06